Pathogens in Tomales Bay Watershed Total Maximum Daily Load (TMDL)

Proposed Basin Plan Amendment

Note: This document contains revisions to the March 4, 2005 document that are being distributed for public review. Revisions to the publicly distributed March 4, 2005 document are identified in <u>underline</u> and ~~strikeout~~.

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California Regional Water Quality Control Board
San Francisco Bay Region

~~March 4~~ <u>July 8</u>, 2005

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Proposed Basin Plan Amendment

The following text is to be inserted in Chapter 4, right after the introduction of a section entitled "Surface Water Protection and Management—Nonpoint Source Control."

Tomales Bay Watershed Pathogens TMDL

The overall goal of the Tomales Bay Watershed Pathogens Total Maximum Daily Load (TMDL) is to ensure protection of water contact recreational uses and Bay shellfish harvesting, thereby minimizing ~~minimize~~ human exposure to disease-causing pathogens. The following sections establish a density-based pathogens TMDL for Tomales Bay and its tributaries, and actions and monitoring necessary to implement the TMDL. The TMDL defines allowable density-based water quality bacteria concentrations and prohibits the discharge of human waste. The associated implementation plan specifies the actions necessary to protect and restore beneficial uses. This TMDL strives to achieve a balance such that human activities including agriculture, recreation, commercial fishing and aquaculture, and residential use coexist and water quality is restored and protected. As outlined in the adaptive implementation section, the effectiveness of implementation actions, monitoring to track progress toward targets, and the scientific understanding pertaining to pathogens will be periodically reviewed and the TMDL may be adapted as warranted.

In addition to pathogens, animal and human waste contain nutrients that in excess pose a threat to aquatic ecosystem beneficial uses. Tomales Bay, Walker Creek, and Lagunitas Creek are listed as impaired by excess nutrients. Human and animal wastes may also contain other harmful constituents such as steroids and pharmaceuticals. In addition to protecting the pathogen-impaired beneficial uses such as shellfish harvesting, water contact recreation, and non-contact water recreation, by eliminating the discharge of human waste and controlling the discharge of animal waste, this TMDL will also protect aquatic ecosystem beneficial uses such as marine habitat, estuarine habitat, cold and warm freshwater habitat, and wildlife habitat from other harmful constituents found in human and animal waste.

Problem Statement

Monitoring results for Tomales Bay and its main tributaries (Lagunitas, Walker, and Olema creeks) indicate that these waters exceed bacteria water quality objectives for shellfish harvesting and recreational waters (Table 3-1) and, as such, are impaired by pathogens. The presence of pathogens is inferred from high fecal coliform bacteria (a commonly used indicator of human pathogenic organisms) concentrations. Pathogen pollution is adversely affecting existing beneficial uses, which include shellfish harvesting (i.e., sport and commercial oyster, clam, and mussel harvesting), water contact recreation (i.e., swimming, fishing) and non-contact water recreation (i.e., boating, kayaking).

This TMDL addresses the following pathogen-impaired water bodies in the Tomales Bay Watershed:

- Tomales Bay
- Lagunitas Creek
- Walker Creek
- Olema Creek

Sources

If not properly managed, the following Tomales Bay Watershed source~~s~~ categories have the potential to discharge pathogens to surface waters: ~~faulty~~ on-site sewage disposal systems (OSDSs), small wastewater treatment facilities and sewage holding ponds, boat discharges, grazing lands, dairies, equestrian facilities, and municipal runoff~~, and wildlife~~. Pathogens sources are identified based on elevated coliform bacteria levels downstream of identified land uses or facilities and from documentation of inadequately treated human waste discharges. The Walker Creek watershed is dominated by grazing lands. Coliform bacteria levels and coliform loads from the Walker Creek watershed are extremely high during storm periods and a significant coliform source to Tomales Bay. High coliform levels detected in storm drains indicate that municipal runoff is a pathogens source. High coliform levels and loads downstream of residential homes and equestrian facilities suggest that failing septic systems, urban runoff, and equestrian facilities are coliform sources. Warm-blooded mammals and birds that reside in the watershed and Bay produce coliform bacteria. During non-storm periods Tomales Bay coliform levels are typically below the water quality objectives for shellfish harvesting waters, indicating that in-Bay wildlife such as seals and birds are not significant sources. Approximately 30% of the lands draining to Tomales Bay are open space forested lands. Water quality monitoring of a watershed on the western shoreline of Tomales Bay with minimal human influences suggests that waters draining open space areas are below tributary bacteria water quality objectives and therefore terrestrial wildlife are not a significant source.

Numeric Targets

Table 4-20 contains ~~The~~ the numeric water quality targets for the Tomales Bay Watershed Pathogens TMDL ~~(Table 4-20)~~. The coliform bacteria targets are based on fecal coliform bacteria concentrations aimed at protecting shellfish consumers and recreational users. These density-based numeric targets define bacterial densities that indicate minimal risk to humans and are the same as ~~based on~~ the water quality objectives contained in Table 3-1. The Tomales Bay targets are intended to protect the most sensitive beneficial use, shellfish harvesting. The tributary targets are intended ~~While water quality objectives~~ to protect recreational uses. ~~are higher than those for shellfish protection, the more stringent objective applies to tributary waters because tributary discharges to Tomales Bay receive minimal dilution.~~ An additional numeric target for Tomales Bay is expressed as the number of days commercial shellfish growing areas are subjected to harvest closures due to elevated water column bacteria densities. Consistent with the definition of “threatened conditions” in the California Shellfish Protection Act, Tomales Bay shellfish growing areas shall not be closed for harvest for more than 30 days per calendar year. The California Department of Health Services requires shellfish growing areas to close for harvesting when 24-hour and 10-

day rainfall totals exceed established thresholds. Rainfall thresholds are established based on the relationship between rainfall and observed fecal coliform levels in Bay waters and shellfish.

In addition, no human waste (raw sewage or inadequately treated waste) shall be discharged to Tomales Bay or its tributaries. The no human waste discharge target is consistent with the existing wastewater discharge Discharge prohibitions Prohibitions 5 and 15, contained in Table 4-1. This target is necessary because human waste is a significant source of pathogenic organisms, including viruses, and attainment of fecal coliform targets alone may not sufficiently protect human health. The coliform bacterial targets in combination with the human waste discharge prohibition and the shellfish harvesting closure targets are the basis for the TMDL and load allocations and fully protect beneficial uses.

Table 4-20
Coliform Bacteria Targets[c] for Tomales Bay and Its Tributaries
(The targets are expressed as Most Probable Number [MPN] of fecal coliforms per 100 mL of water.)

Waterbody	**Fecal Coliform** (MPN/100 mL)
Tomales Bay	Median < 14 [a] 90th percentile < 43 [b]
Tomales Bay Tributaries	Single-sample maximum: 43

a. Based on a minimum of five consecutive samples equally spaced over a 30-day period.
b. No more than 10% of total samples during any 30-day period may exceed this number.
c. These targets are applicable year-round.

Table 4-20
Water Quality Targets[a] for Tomales Bay and Its Tributaries

Zero discharge of human waste
Shellfish harvest closures < 30 days/year
Coliform Bacteria Levels (expressed as Most Probable Number [MPN] of fecal coliforms per 100 mL of water) Tomales Bay Median < 14 [b] and 90th percentile < 43 [c] Tomales Bay Tributaries Log mean <200 [b] and 90th percentile < 400 [c]

a. These targets are applicable year-round
b. Based on a minimum of five consecutive samples equally spaced over a 30-day period
c. No more than 10% of total samples during any 30-day period may exceed this number.

Total Maximum Daily Load

Table 4-21 lists the Tomales Bay Watershed Pathogens TMDL. ~~The TMDL is applicable year-round.~~ The TMDL consists of the density based coliform bacteria TMDL targets. ~~for Tomales Bay is the same as the Bay TMDL target, which is the shellfish harvesting water quality objective.~~ The TMDL ~~also~~ ensures protection of ~~tributary~~ water contact recreational uses ~~as well as~~ and Bay shellfish harvesting, ~~through the tributary TMDL target.~~ thereby minimizing human exposure to disease causing pathogens.

Table 4-21
Total Maximum Daily Load of Pathogens Indicators for Tomales Bay and its Tributaries

Waterbody	**Indicator Parameter**	**TMDL** (Most Probable Number (MPN) of fecal coliforms per 100 mL of water)
Tomales Bay	Fecal coliform	Median < 14 [a] 90th Percentile < 43 [b]
Major Tributaries: Walker Creek Lagunitas Creek Olema Creek	Fecal coliform	~~Single-Sample Maximum < 43~~ Log mean <200 [a] 90th percentile < 400 [b]

[a.] Based on a minimum of ~~no less than~~ five consecutive samples equally spaced over a 30-day period.

[b.] No more than 10% of total samples during any 30-day period may exceed this number.

Load Allocations

Table 4-22a presents density-based load allocations for Tomales Bay Watersheds pathogens source categories, and Table 4-22b presents allocations to specific tributaries. Load allocations to the tributaries reflect the highest fecal coliform concentrations that can be discharged while still attaining and maintaining the shellfish harvesting water quality objectives in the Bay.

Discharging entities will not be held responsible for uncontrollable coliform discharges originating from wildlife. If wildlife contributions are determined to be the cause of exceedances, the TMDL targets and allocation scheme will be revisited as part of the adaptive implementation program.

~~When all dischargers (i.e., individual facilities, property owners, etc.) associated with each source category meet the density-based allocation, the TMDL allocations will be achieved. Alternatively, when tributary waters meet the density-based allocation, the TMDL allocations will be achieved.~~

Table 4-22a **Density-Based Pollutant Wasteload and Load Allocations[a] for Dischargers of Pathogens in Tomales Bay Watershed**			
Categorical Pollutant Source	**Load Allocation** **Fecal Coliform (MPN/100 mL)**		
	For Direct Discharges to the Bay		**For Discharges to Major Tomales Bay Tributaries**
	Median[b]	**90th percentile[c]**	**Log Mean[b]**
Onsite Sewage Disposal Systems	0	0	0
Small Wastewater Treatment Facilities	0	0	0
Boat Discharges	0	0	N/A
Grazing Lands	14	43	95
Dairies	14	43	95
Equestrian Facilities	14	43	95
Municipal Runoff	14	43	95
Open space lands[d]	14	43	95

a. These allocations are applicable year-round. Wasteload allocations apply to any sources (existing or future) subject to regulation by a NPDES permit.
b. Based on a minimum of five consecutive samples equally spaced over a 30-day period.
c. No more than 10% of total samples during any 30-day period may exceed this number.
d. Open space lands contain wildlife and are therefore recognized as a potential source areas. These areas are not believed to be a significant source of pathogens and the contribution is considered natural background; therefore, no management measures are required.

Table 4-22b **Density-Based Pollutant Load Allocations for Tomales Bay Tributaries**	
Tributary	**Allocation** **Fecal Coliform (MPN/100 mL)** **Log Mean**
Walker Creek at Highway 1 Bridge	95[a]
Lagunitas Creek at Green Bridge	95[a]

a. Based on a minimum of five consecutive samples equally spaced over a 30-day period.

Implementation Plan

The Tomales Bay Watershed Pathogens TMDL Implementation Plan builds upon previous and ongoing successful efforts to reduce pathogen loads in Tomales Bay and its tributaries. The plan requires actions consistent with the California Water Code

(CWC 13000 et seq.), the state's Nonpoint Source Pollution Control Program Plan (CWC Section 13369) ~~and~~, the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program~~.~~[1] and human waste discharge prohibitions (Prohibitions 5 and 15, Table 4-1).

This plan specifies required implementation measures (Table 4-23) for each of the source categories (Table 4-22). These implementation measures include evaluation of operating practices, development of comprehensive site-specific pathogens control measures and an ~~plans,~~ implementation schedule for such ~~of site-specific~~ management measures, and submittal of progress reports documenting actions undertaken. Progress reports may be submitted directly to the Water Board or, if designated, through third parties. These progress reports will serve as documentation that source reduction measures are being implemented. While third parties may provide valuable assistance to TMDL implementation, the discharger is the entity responsible for complying with the specified regulations and regulatory controls. Responsible parties within each source category are required to implement the measures ~~identified~~ as specified in Table 4-23 ~~by January 2009.~~ For purpose of demonstrating attainment of applicable allocations, responsible parties will only be responsible for compliance with specified implementation measures and applicable waste discharge requirements or waiver conditions. Any further requirements would require Board action to revise these implementation measures.

The state's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program requires that current and proposed nonpoint source discharges are regulated under waste discharge requirements (WDRs), waiver of waste discharge requirements, Basin Plan prohibition, or some combination of these tools. Table 4-24 describes the method that will be used to regulate dischargers in each source category.~~of the pathogens.~~ The Water Board currently has a policy establishing conditions for waiving WDRs for dairies. The Water Board intends to work with stakeholders to develop similar waiver policies for grazing lands and equestrian facilities.

[1] State Water Resources Control Board. 2004. *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Prevention Control Program*.

Table 4-23

Trackable Implementation Measures for the Tomales Bay Watershed Pathogens Total Maximum Daily Load[1]

Source Category	Action	Implementing Party	Completion Dates
On-Site Sewage Disposal Systems (OSDS)	Submit to the Executive Officer for approval a plan and implementation schedule to evaluate OSDS performance for the Tomales Bay watershed and to bring identified OSDS up to County's repair standards. ~~Establish a watershed-wide management program that documents and assess performance of OSDS.~~	Marin County, Community Development Agency	January 2007
	~~Develop management plan for meeting repair standards for all OSDSs that fail to pass inspection~~.	~~Marin County, Community Development Agency~~	
	Report progress on implementation of OSDS ~~assessment~~ evaluation and repair program.	Marin County, Community Development Agency	Starting January 2011 and biennially thereafter
Small Wastewater Treatment Facilities	Comply with applicable Waste Discharge Requirements (WDRs).	Small wastewater treatment facilities	As specified in the applicable WDRs
	Inspect and evaluate all permitted WDR facilities and update WDRs as warranted.	Water Board staff	January 2009
	Report progress on inspection and evaluation of WDR facilities.	Water Board staff	No less than once every five years starting in January 2009
Boat Discharges	In coordination with interested stakeholders in Tomales Bay, make a determination on ~~Evaluate~~ the adequacy of on-shore restroom facilities and boater disposal/pump out facilities and prepare a schedule for a determination of Pumpout Facility Need and Public Hearing Notification, as appropriate. ~~and develop and~~	Regional Water Board	January 2009
	~~implement a plan to ensure adequate facilities are provided in Tomales Bay.~~	~~Point Reyes National Seashore, California Coastal Commission, California State Lands Commission, California State Parks, County of Marin, Regional Water Board, Gulf of the Farallones National Marine Sanctuary~~	

Boat Discharges (continued)	Water Board will coordinate with participating agencies and rely on their interests and authorities to ~~D~~ddevelop and implement a Tomales Bay boating management plan ~~for Tomales Bay~~ that includes: evaluation of existing moorings and water quality impacts; ~~recommendations for mooring exclusion zones;~~ permitting ~~procedures for mooring;~~ and enforcement procedures to ensure compliance with applicable mooring requirements and to ensure ~~exclusion areas and~~ no sewage discharge from boats.	Point Reyes National Seashore, California Coastal Commission, California State Lands Commission, California State Parks, County of Marin, Regional Water Board,-Gulf of the Farallones National Marine Sanctuary.	January 2009
	Report progress on ~~implementing waste facilities and~~ implementation of boating management plan.	As specified in the Boating Management Plan: Point Reyes National Seashore, California Coastal Commission, California State Lands Commission, California State Parks, County of Marin, Regional Water Board, Gulf of the Farallones National Marine Sanctuary	As specified in the Boating Management Plan
	Comply with boating management plan for Tomales Bay.	Boaters	As specified in the Boating Management Plan
Grazing Lands[2] ~~(Ranchland and Riparian Pastureland)~~	Submit a Report of Waste Discharge to the Water Board that provides the following: a description of the facility; ~~i~~identification ~~y~~ of necessary site-specific grazing management measures ~~that will~~ to reduce ~~pathogens~~ animal waste runoff; and a schedule to implement identified management measures.	Dairies and ranchers (landowners and leasees). These Reports may be submitted individually or jointly or through a third party.	January 2009
	~~Comply with state's Nonpoint Source Guidelines for Rangelands~~	~~Dairies and ranchers (landowners and Leasess)~~	
	Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs. ~~Implement grazing management measures that reduce pathogens runoff~~	Dairies and ranchers (landowners and leasees)	As specified in applicable WDRs or waiver of WDRs
	Report progress on implementation of grazing management measures that reduce ~~pathogens~~ animal waste runoff.	Dairies and ranchers (landowners and leasees). These reports may be submitted individually or jointly or through a third party.	As specified in applicable WDRs or waiver of WDRs

[2] Grazing lands include all land areas grazed by livestock such as ranchlands, riparian areas, and pasturelands. Confined animal facilities which are already regulated under existing WDRs or waiver of WDRs and are excluded from this requirement.

Dairies[3]	Comply with applicable Waiver of Waste Discharge Requirements (WDRs) for confined animal facilities or requirements specified in applicable individual WDRs. ~~animal waste guidelines and dairy waiver provisions.~~	Dairies (landowners and leasees)	As specified in applicable WDRs or waiver of WDRs
Equestrian Facilities	Submit a Report of Waste Discharge to the Water Board that provides the following: a description of the facility; identification of necessary site-specific management measures to reduce animal waste runoff; and a schedule to implement identified management measures. ~~Complete watershed-wide assessment of equestrian facilities and identify management measures necessary to reduce pathogens runoff.~~	Equestrian facilities. ~~Marin County, and Marin County Stormwater Pollution Prevention Program~~ These Reports may be submitted individually or jointly or through a third party.	January 2009
	Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs. ~~Implement management measures that reduce pathogens runoff~~	Equestrian facilities ~~Marin County, and Marin County Stormwater Pollution Prevention Program~~	As specified in applicable WDRs or waiver of WDRs.
	Report progress on implementation of management measures that reduce animal waste runoff.	Equestrian facilities. These reports may be submitted individually or jointly or through a third party.	As specified in applicable WDRs or waiver of WDRs
Municipal Runoff	Submit to Water Board for approval a stormwater management plan (~~Report progress on implementation of~~ that includes management measures to reduce pathogens runoff and a schedule for implementation of identified management measures.	~~Equestrian facilities,~~ Marin County, ~~and Marin County~~ Stormwater Pollution Prevention Program	January 2009
	~~Implement stormwater management plan.~~	~~Marin County, Stormwater Pollution Prevention Program~~	
	~~Update/amend stormwater management plan to include specific measures to reduce pathogen loading for Tomales Bay watershed~~	~~Marin County, Stormwater Pollution Prevention Program~~	
	Report progress on implementation of pathogens reduction measures.	Marin County, Stormwater Pollution Prevention Program	As specified in approved stormwater management plan

[1] ~~All actions to be implemented by January 2009~~.

[3] These implementation actions for Dairies are for the confined animal portions of the facilities and do not include the grazing areas. Implementation actions for grazing lands associated with dairies are included under Grazing lands.

Table 4-24 **Regulatory Framework for Discharges by Source Category**	
Source Category	**Regulatory Tool**
On-site Sewage Disposal Systems (OSDS)	Waiver[a1] of Waste Discharge Requirements Prohibition of Human Waste Discharge
Small Wastewater Treatment Facilities	Individual facility Waste Discharge Requirements Prohibition of Human Waste Discharge
Boat Discharges	Prohibition of Human Waste Discharge ~~applies to all boaters in Tomales Bay~~
Grazing Lands~~(Ranchlands and Riparian Pasture Lands)~~	Waiver[a1] of Waste Discharge Requirements
Dairies	Waiver[a1] of Waste Discharge Requirements or Individual WDRs, as appropriate
Equestrian Facilities	Waiver[a1] of Waste Discharge Requirements
Municipal ~~Storm Water~~Runoff	~~General~~ NPDES Permit
[a1] Water Board retains the option of requiring individual waste discharge requirements or compliance with a discharge prohibition, as appropriate.	

Agricultural Water Quality Control Program Costs

The implementation measures for grazing lands and dairies constitute an agricultural water quality control program and therefore, consistent with California Water Code requirements (Section 13141), the cost of the program is specified herein. The total program implementation cost for these agricultural sources is estimated to range between $900,000 – $2 million per year over the next 10 years. The estimated cost will be shared by Tomales Bay watershed grazing lands operators (approximately 150). This estimate includes the cost of implementing animal waste control and grazing management measures and is based on costs associated with technical assistance and evaluation, installation of water troughs, and cattle control fencing along all streams. The program cost estimate may be high as it does not does not account for implementation actions already underway or areas that may not require new fencing. Potential financing sources include federal and state water quality grants and federal agricultural grants.

Evaluation and Monitoring

Dischargers, stakeholders, and Water Board staff will conduct water quality monitoring to evaluate fecal coliform concentration trends in Tomales Bay and its tributaries. Five years after TMDL adoption, the Water Board will evaluate monitoring results and assess progress made toward attaining TMDL targets (Table 4-20) and load allocations (Table 4-22).

In 2009 and approximately every five years after the adoption of the TMDL, the Water Board will evaluate site specific, sub-watershed specific, and watershed-wide

compliance with the trackable implementation measures specified in Table 4-23. In evaluating compliance with the trackable implementation measures, the Water Board will consider the level of participation of each source category as well as individual dischargers (as documented by Water Board staff or ~~designated~~ third parties).

Approximately every five years, the Water Board will determine if reasonable implementation progress has been made and if additional regulatory or enforcement actions are necessary. If a discharger demonstrates that all technically and economically feasible and cost effective source control measures have been undertaken and that it is infeasible to meet their allocation due to wildlife contributions, the Water Board will consider revising allocations as appropriate. If source control actions are fully implemented throughout the Watershed and the TMDL targets are not met, the Water Board may consider re-evaluating or revising the TMDL and allocations. If, on the other hand, the required actions are not fully implemented, or are partially implemented, the Water Board may consider regulatory or enforcement action against parties or individual dischargers not in compliance.

The California Department of Health Services, working in consult with the Shellfish Technical Advisory Committee, is encouraged to periodically evaluate, beginning in 2009, shellfish harvest closure guidelines and the relationship between precipitation, runoff, coliform levels, and water quality exceedances.

In order to assess water quality improvements and obtain additional information for further refinement of the TMDL, Water Board staff and stakeholders will collaborate to monitor water quality. The main objectives of the Monitoring Program are to:

- Assess attainment of TMDL targets;
- Evaluate spatial and temporal water quality trends in the Bay and its tributaries;
- Further identify significant pathogens source areas;
- Evaluate coliform levels and loadings to the Bay at the terminus of major tributaries.
- Collect sufficient data to calibrate and validate the Bay hydrodynamic model to observed coliform levels; and
- Collect sufficient data to prioritize implementation efforts and assess the effectiveness of implementation actions.

Table 4-25 outlines the locations, constituents, sampling frequency, analytical methods, and the sampling entities for a baseline water quality monitoring program. Additional monitoring will be conducted as needed if funds are available. The Water Board, in coordination with the sampling entities and interested third parties, such as National Park Service, California Department of Health Services, commercial shellfish growers, the Inverness Public Utility District, and Salmon Protection and Watershed Network will implement the this long-term water quality monitoring program. All water quality monitoring (including Quality Assurance and Quality Control procedures) will be performed pursuant to the State Water Board's Quality Assurance Management Plan for the Surface Water Ambient Monitoring Program.

Table 4-25
Baseline Water Quality Monitoring Program

Constituent	Location	Frequency	Sampling Entities
Tomales Bay			
Fecal Coliform[a]	California Department Health Services designated primary water quality monitoring stations	Weekly for five weeks beginning in January; Monthly March - December	Shellfish Growers
Tributaries			
Fecal coliform Stream Flow	Olema Creek (tributary to Lagunitas)	Weekly for five weeks beginning in January; Monthly March - December	National Park Service
Fecal coliform	West Shore tributaries	Same as above	Inverness Public Utilities District
Fecal coliform	East Shore tributaries	Same as above	Water Board
Fecal coliform Stream Flow	Lagunitas Creek	Same as above	Water Board, Salmon Protection and Watershed Network
Fecal coliform Stream Flow	Walker Creek	Same as above	Water Board

a. E. coli monitoring may be used in the future to assess general water quality trends and exceedances. If E. coli is used, a Tomales Bay specific correlation factor linking fecal coliform and E. coli levels will need to be established.

Adaptive Implementation

Approximately every five years, the Water Board will review the Tomales Bay Watershed Pathogens TMDL and evaluate new and relevant information from monitoring, special studies, and scientific literature. The reviews will be coordinated through the Water Board's continuing planning program and will provide opportunities for stakeholder participation. Any necessary modifications to the targets, allocations, or implementation plan will be incorporated into the Basin Plan. In evaluating necessary modifications, the Water Board will favor actions that reduce sediment and nutrient loads, pollutants for which the Tomales Bay Watershed is also impaired. At a minimum, the following questions will be used to conduct the reviews. Additional questions will be developed in collaboration with stakeholders during each review.

1. Are the Bay and the tributaries progressing toward TMDL targets as expected? If progress is unclear, how should monitoring efforts be modified to detect trends? If there has not been adequate progress, how might the implementation actions or allocations be modified?
2. What are the pollutant loads for the various source categories (including naturally occurring background pathogen contributions and the contribution from open space lands), how have these loads changed over time, how do they vary seasonally, and how might source control measures be modified to improve load reduction?

3. Is there new, reliable, and widely accepted scientific information that suggests modifications to targets, allocations, or implementation actions? If so, how should the TMDL be modified?
4. The ~~targets and~~ allocations ~~do not take into account~~ assume a conservative bacterial die-off rate of 0.02 per hour ~~and are therefore conservative (more protective).~~ This value is based on rates reported for San Francisco Bay in 1970. If bacterial die-off ~~between discharge points and the Bay~~ is found to be ~~significant~~ higher, higher allocations may be considered. What are bacterial die-off rates in the water column and stream sediments? Do they vary by season? What are bacteria transport times from sources to the Bay?
5. The tributary ~~target,~~ source allocations ~~and TMDL~~ assume that minimal dilution ~~of tributary waters~~ takes place between discharge points and the mouth of Walker and Lagunitas Creeks~~. and Tomales Bay shellfish harvesting areas and are therefore conservative (more protective).~~ If modeling and/or water quality studies suggest that the Bay can attain targets with higher pathogen ~~concentrations~~ allocations ~~in~~ to tributary ~~waters~~ sources, the TMDL may be revised accordingly. How does estuarine mixing and dilution of tributary waters vary by flow and season?
6. What is the relationship between precipitation, runoff, tributary loads, Bay coliform levels, and water quality exceedances and shellfish harvesting closures?
7. Are there bacteria in Tomales Bay sediments that enter the water column during storm events? If yes, how should this process be accounted for?

If it is demonstrated that all reasonable and feasible source control measures have been implemented for a sufficient period of time and TMDL targets are still not being met, the Water Board will reevaluate water quality standards, TMDL targets and allocations as appropriate. Discharging entities will not be required to do more than what is considered reasonable and feasible.

The following table will be added to the section at the end of Chapter 4 entitled "Continuing Planning," right after the table for the San Francisco Bay Mercury TMDL.

Regional Board Resource Allocation

The items below have been identified in this review as specific areas for which Water Board planning resources should be allocated. The items are divided into categories and each item is followed by an estimate of the frequency at which the item will be reviewed. Resolution of these items may result in future Basin Plan amendments.

Total Maximum Daily Load	**Frequency**
Review the Tomales Bay Watershed Pathogens TMDL and evaluate new and relevant information from monitoring and scientific literature. Determine if modifications to the targets, allocations, or Implementation Plan are necessary.	Every five years